

The influence of ageing on bra preferences and self perception of breasts among mature women

European Journal of Ageing

Abstract

The ageing process has both psychological and physiological effects on women, and tactical choices are often made regarding beauty interventions to mask the outward signs of increasing age. The bra is believed to counteract the negative effects of ageing on the breast and alter the perceptions of one's body. Due to the profound anatomical changes to the breast with increasing age, this paper aimed to examine the influence of ageing on women's perceptions of their breasts and their bra preferences. 208 women aged 45 to 65 years were surveyed about their breasts, their bras, and how they felt ageing may have influenced these. The findings showed 80% of women surveyed had noticed a significant change in their breasts with ageing, just 7% of the women surveyed were still proud of their breasts and 84% of women dressed to look younger. Further, over 50% of respondents would now not wear the bra they had worn in their twenties, indicating a change in bra preferences with age. The bra variables of primary importance to participants were: comfort, the bra's ability to stay in place, optimal fit, appearance under clothing, support, discreetness, shoulder strap design, silhouette, breast shape, fabric and breast lift. These variables are perceived as being influential in the appropriateness of the bra and its social role for mature women, therefore, it is these bra variables that should be the focus of subsequent research regarding the optimisation of bras for women aged 45 to 65 years.

Key words: *survey, breast health, older women, age appropriate clothing*

Introduction

The social obsession with youthfulness is well documented; with mature women in particular feeling pressured to overtly battle the signs of increasing age (Baltes and Carstensen 1996; Clarke and Griffin 2008; Clarke, Griffin and Maliha 2009; Oberg and Tornstam 1999; Twigg 2007). Beauty interventions are one method women undertake in response to the ageing process and include; hair dye, make-up and cosmetic surgery (Clarke and Griffin 2008). Such outward appearance interventions may mask a woman's chronological age and allow competition for romantic partners, employment, and social recognition (Clarke, Griffin and Maliha 2009; Clarke and Griffin 2008). Despite this, mature women are traditionally cited to have little place in fashion and clothing literature (Twigg, 2007) due to social demands for youth, although clothing has an influence on outward appearance and subsequently society's perception of a mature woman (Clarke, Griffin and Maliha 2009).

The clothing preferences of mature women have been neglected in the literature (Twigg 2007). In particular, bra preferences have been ignored, despite the bra being used as a social tool to uplift the breast into a more youthful appearance and reduce the signs of increasing age (Sukumar 2007). Research has also found 46% of women aged 35 to 65 years to be dissatisfied with their upper torso and breast area (Deeks and McCabe 2001; McLaren and Kuh 2004). More recent research showed that the bra is used by older women to 'alter the perception of one's body' and 'improve self confidence' (Risius et al. 2012: 373). The function of a bra is to reduce breast ptosis (sag) by lifting the breast, and present a more pert, youthful breast shape, which is commonly seen as more attractive and acceptable in society (Risius et al. 2012). Bra related literature has typically centred on younger women and rarely considers the role of the bra among older women (Risius et al. 2012), and the influence of ageing on a woman's perception of her breasts and bra preferences remains poorly understood.

It is important that clothing be appropriate to an individual's physiology (Twigg 2007). Anatomical research has identified profound changes within the female breast with increasing age (Rosen 2001). Ageing is cited to influence the volume, density and constitution of the breast tissue (Tonkelaar, Peeters and van Noord 2004). A combination of glandular atrophy, increased skin laxity and weakened breast ligaments (known as Cooper's ligaments) cause an inferior lateral migration of the breast (Brown et al. 1999). These anatomical changes alter the size, shape and internal support of the breast, and occur in relation to the hormonal changes seen due to ageing and the menopause (Rosen 2001). With lingerie both stimulating and reflecting various aspects of a woman's identity, the impact of these age related changes upon a women's perception and experience of femininity and sexuality are believed to subsequently influence her bra preferences (Tsaousi and Brewis, 2012).

Although the experience of ageing in individuals is diverse, women have been found to identify their breasts as a 'distressing' change due to ageing (McLaren and Kuh 2004: 48). In a broad spectrum, ageing is cited to cause a loss of self-esteem, insecurity in relationships, and perceived invisibility (Clarke and Griffin 2008). However, perception of the type of change to the bra requirements of mature women has not been detailed. Moreover, ageing may influence bra design preferences, consumer behaviour and opinion of the bra market (Paulson and Willig 2008; Risius et al. 2012; Sukumar 2007). Any psychological changes with age may be similarly

influential with regard to the perception of bra performance. For example, Risius et al. (2012) detailed the influence of psychological aspects on the perceived performance of a bra, stating that a good bra has the capability to improve self-confidence by 'altering the perceptions of one's body'. Therefore, if a bra impacts upon the way a woman's body is viewed, preferences for bras may adapt to match the self-perception of one's body.

Clarke, Griffin and Maliha (2009) found women to differentiate between clothing alternatives for different age ranges, observing that their choice of colour and style had been influenced by their change in body shape. It is believed that brassieres should be designed based on specific shapes, populations and usages, whereas many bras on the market are currently advertised to a population too broad for their purpose (Krenzer, Starr and Branson 2000), and may not elicit optimal self confidence for all women. Therefore, by understanding the consumer preferences and requirements of each subpopulation, bras may be designed to more appropriately reflect individual woman's femininity and character (Tsaousi and Brewis 2012).

The bra was the most advertised underwear item of the 1950s and designs were predominantly pink and cone shaped (Caldwell 1981). Fashion has greatly adapted since then, and mature women have acknowledged these changes, claiming they previously would not 'have been seen dead in what (they are) wearing now' (Paulson and Willig 2008: 117). The participant interviewed in Paulson and Willig's (2008) study referred to the post-war style as 'so old-fashioned now', suggesting her change in clothing choice was influenced by fashion culture, rather than physical differences due to ageing. This indicates the bra preferences of women may change over time; indeed, recent research has found that the majority of mature consumers hold different priorities for fashion garments than younger consumers (Birtwistle and Tsim 2005; Risius et al. 2012). Despite this finding, the current lingerie market revolves around designs for younger women that mature women often perceive to be inappropriate for their current physique and personality, due to inappropriate colour, cut, or style of the clothing (Twigg 2012).

Risius et al. (2012) explored influential factors of lingerie purchasing in mature women presented a broad view of factors which may influence bra purchasing, including; the importance of the bra fitter's knowledge, shop environment and lack of time when shopping. Indeed, many of the data themes in Risius et al.'s (2012) study were not directly related to bra performance, and therefore give little insight to assessing a bras performance for mature women. The findings presented by Risius et al. (2012), in combination with the anatomical shift of the breast with ageing and perceptions of femininity (Clarke and Griffin 2008), suggest it may be appropriate for lingerie to be designed and marketed specifically for mature women. In order to design population specific bras, it is necessary to understand the variables that mature women consider when purchasing and wearing a bra.

Kim, Hong and Scheurell (2004) used a survey design to determine variables that women wanted from a bra and a corresponding importance rating for each of these variables. Kim, Hong and Scheurell (2004) found that bra fit, breast shape, aesthetic properties of the bra, pressure sensation, movement of the bra, strap-related properties and overall sensation were primary bra considerations. Whilst informative, Kim, Hong and Scheurell's study

sampled women aged 30 to 40 years, and did not include bra considerations of mature women or the effects of menopausal transition on self confidence or femininity, thus missing a key subgroup with unique characteristics which may need addressing with regard to bra design.

The growing body of research indicates both psychological and physiological changes among women aged 45 to 65 years, incorporating both self-perception of breast related changes and societies judgement of mature women's breasts. Therefore, the present study aimed to contribute to the literature by exploring variables that are key to bra satisfaction for mature women, and provide fundamental information on which subsequent bra related literature may focus. In addition, the study presented here aimed to understand the role of the bra for mature women in a modern, British society and explore women's perception of how ageing has influenced their breasts. Whilst also identifying practical areas of importance that may be used to improve the design of bras for mature women and subsequently improve their self confidence and self perception (Risius et al. 2012).

Methodology

This study received institutional ethical and scientific approval from the BioSciences Research Ethics Committee (ref: BSREC 2010/001) prior to data collection.

Sample

Participants were initially recruited via an advertisement through the institutional intranet, and subsequently through word of mouth. It is acknowledged that the generalisability of the study suffers the same limitations of any convenience sample; the influence of socio-cultural positioning is excluded, participants tend to feel strongly about an issue to volunteer, and favour a particular outcome (Sousa, Zauszniewski and Musil 2004). However, a convenience sample was adopted to help maximise response rate, in addition, surveys were posted and included a prepaid addressed envelope to return the completed survey (Dillman, Sinclair and Clarke 1993). The inclusion criteria of the study were listed on the front cover of the survey, these were: United Kingdom based females, having experienced no surgical procedures to their breasts or undergone any form of clinical breast treatment at any time, wore a bra on a daily basis and not having given birth or breast fed in the last year.

All participants were between 45 and 65 years of age. The rationale for this age range emanated from previous research, which has used it as a standard for the mature consumer (Birtwistle and Tsim 2005; Hsieh 2011; Risius et al. 2012). A total of 260 surveys were sent out to potential participants, of which 214 were returned. Three of these surveys were returned blank, one respondent was aged 44 years and two had experienced some form of breast surgery and therefore did not meet the inclusion criteria for this study. A total of 208 usable surveys were therefore returned, resulting in a valid response rate of 80%. Responses came from a wide geographic area across the United Kingdom.

Procedures and Measures

In order to address the research aims, a survey was developed in accordance with Hinkin's (1995) theory on scale development. A thorough literature search was conducted to discover any bra related variables that may be of importance to women (Risius et al. 2012). For example, using strong and non-abrasive material was cited as

important in sports bras (McGhee and Steele 2006); therefore, a question was included regarding the importance of appropriate fabric in an everyday bra. As seen in previous bra related surveys, questions regarding respondents demographics, purchasing habits and bra fitting history were also included in order to develop a wider understanding of the population (Bowles, Steele and Munro 2008; Liang 2008). In addition, questions regarding hormone replacement therapy (HRT) use, bra size, and parity were included, as these variables have a potential influence on the anatomy and ageing process of the breast.

A combination of selected responses (tick box), specific responses (written answers) and scaled (rate on a scale of one to five) questions were used. Based on the literature of survey scales, numerical analogue scales (NAS) with extreme value descriptors were selected to assess the importance of performance variables (listed in table 1). A NAS length of one to five was selected in order to minimise confusion and response fatigue for participants, and maximise response rate (Hasson and Arnetz 2005; Hinkin 1995). This scale format also matched those previously used in breast related surveys (Kim, Hong and Scheurell 2004). In accordance with suggestions in the literature, the questions were displayed in two columns on each page, in sanserif typeface, no questions were split between pages and all options were in a vertical arrangement in bold font (Frazer and Lawley 2000). Headed paper was also used for all surveys to enhance the trustworthiness and give a professional appearance (Gillham 2007).

A female researcher trained in research methods to a postgraduate level and a woman that met the study's inclusion criteria examined the survey for important omissions or inappropriate wording of items (Litwin 1995). As a result of this, minor changes were made to the survey, included adding the statement 'This survey should take no longer than ten minutes to complete'. Two questions were re-worded to clarify their meaning, and four additional questions were added based on the feedback. The survey was subsequently provided to a group of 11 women to predict the approximate time taken by participants to complete all answers, which was found to be approximately ten minutes (Frazer and Lawley 2000).

Data analysis

Participant demographics are presented as means and standard deviations, results of categorical questions are expressed as the percentage of participants in each response group (one to five) (Godwin, Wood and O'Neill 1998). The ordinal scale questions were subjected to a mode calculation of central tendency, which has been proposed as the optimal method (Blaikie 2003; Clegg 1998; Jamieson 2004). The bra performance variables that are key to bra satisfaction for mature women were therefore determined using the modes from the numerical analogue scales (one to five) (Blaikie 2003; Clegg 1998; Garland 1991; Jamieson 2004). It has been suggested that numerical analogue scales show directionality of opinion, rather than finite values, therefore variables with a mode of four or five are deemed important and rated as key variables, those with a mode below this are deemed unimportant (Garland 1991; Liu and Arnett 1999). If participants left a question blank or their response was unclear it was omitted and defined as a missing value in order to avoid affecting the results (Gillham 2007).

In order to address the aim of identifying practical areas of importance to improve bra design, principal component analysis (PCA) with varimax rotation (v16.0; SPSS Inc., Chicago, IL, USA) was conducted on the numerical analogue data in order to observe any commonality between key performance variables. This allowed Spearman's rho correlations of factors identified in PCA to be conducted with age, cup size, band size, hormone replacement therapy (HRT) use and parity, with a Bonferroni correction factor applied ($p < .01$).

Results

The 208 respondents spanned across the 20 year inclusion category age range (mean 56.3 ± 5.7 years); self reported body mass averaged 67.9 ± 12.1 kg. The majority of women were postmenopausal (69%, $n=143$), pre- and peri- menopausal women were near equal in number (14%, $n=29$ and 16%, $n=32$ respectively). Eleven per cent ($n=22$) of the women were taking HRT. Reported bra sizes ranged from band size 32 to 44 inches and cup size A to J (32A to 44C and 32A to 38J respectively) with a mode bra size of 36C. The average number of pregnancies was two (44%, $n=91$) and 86% ($n=152$) of these women breast fed for an average of six months. Twelve per cent ($n=25$) of women that responded had had no pregnancies. The majority of women reported themselves as being moderately active (53%, $n=109$) but 56% ($n=116$) of participants did not own a sports bra and most experienced no mastalgia (breast pain) (87%, $n=171$). Of those that did suffer with mastalgia, 63% did nothing to relieve their mastalgia, 17% home treated with paracetamol, 10% took evening primrose oil capsules which are reported to help ease mastalgia (Davies et al. 1998), and just one out of all the women suffering with mastalgia had been to her doctor.

Self Perception of breasts

Seventy seven per cent of women viewed their breasts as part of their femininity, less than 1% cent perceived them as a tool for seduction, just 7% of women were proud of their breasts, and 8% of women disliked their breasts. Exactly half of women were unhappy with their age, with only 16% of women responding that they did not try to look younger. When asked 'of all the physical changes you have experienced through ageing, how significant has the change to your breasts been?', just 20% of women responded 'not at all'. Therefore, four out of five women associated ageing with a change to their breasts. When asked what the key change had been in their breasts, the top three responses were sagging (28%), an increase in size (24%) and feeling less firm (10%). These responses are noteworthy because this question was open ended and provided no list of options to choose from.

When asked whether they had noticed any change in breast size since the age of 45 years, the majority of women reported an increase in size (51%, $n=106$). However, 39 % ($n=80$) reported no size change and just 10% ($n=21$) reported a decrease in size. Only 10% of respondents reported their breasts becoming more sensitive/painful since the age of 45 years, with 17 % reporting a decrease in sensitivity and 73% reporting no change.

Perception of bras

When asked if they would have worn their current bras in their twenties, 43% (n=88) said no. Similarly, when asked if they would now wear the bras they had worn in their twenties, 62% (n=126) said no. Table one shows the bra variables included in the survey. PCA was conducted on the 11 key bra variables. Inspection of the Scree plot revealed a turning point at the third component, it was therefore decided that two factors would be included in further analysis. Varimax rotation revealed a simple structure (Field 2009); the two components explained a total of 39% of the variance, with component one contributing 24% and component two contributing 15%. Items regarding the wearer's perception (support, comfort, fit, stays in place, shoulder straps, fabric, discreetness) load strongly on factor two, whereas items regarding other's perception (silhouette, appearance under clothes, shape, and lift) load strongly on factor one, this can be seen in table two. The factors were therefore interpreted as 'internal' and 'external' bra related factors respectively.

Insert Table 1 here

Insert Table 2 here

In order to determine whether there was a significant relationship between age, cup size, band size, HRT use and parity, and their rating of internal and external bra related factors, Spearman's rho correlations were conducted. Results are shown in table two and indicate that the only significant effect was seen between bra cup size and internal bra related factors.

Insert Table 3 here

Discussion

The present study aimed to explore mature women's perception of their breasts and their bra requirements in order to provide information that may elicit improved bra designs for this population. The results indicate women aged 45 to 65 years are aware of a physical change in their breasts, experience a change in the perception of their breasts and a difference in bra preferences in comparison to their younger selves. Further, this sample perceived 11 key bra performance variables to influence the appropriateness of a bra for mature women. These were: comfort, bra's ability to stay in place, bra fit, bra's appearance under clothing, breast support, discreetness, shoulder straps, upper torso silhouette, breast shape, bra fabric, and breast lift.

The results indicate that 84% of women in the present study tried to mask their age or look younger, and just 7% of women surveyed were proud of their breasts. This indicates that older women in this study were not happy with the current appearance of their breasts. However, given the bra has been identified as a tool to alter the perceptions of one's body and reduce the effects of ageing (Clarke and Griffin 2008; Risius et al. 2012), an improved bra design for women aged 45 to 65 years may increase pride in their breasts and subsequently improve self confidence (Risius et al. 2012). The results also show that 77% of women surveyed viewed their breasts as a part of their femininity. It is understood that bras may reflect and impact upon a number of self-related themes, such as; sexuality, femininity and modesty, and, despite the common perception that the bra

should not be outwardly visible (Tsaousi and Brewis 2013; Risius et al. 2012), a bra should be an expression of that identity (Tsaousi and Brewis 2013). In order to harmonise the bra with individual perceptions of femininity and breasts, bra designs for older women should centre on feminine designs. These findings indicate that the age-resistance of mature women and the strategic clothing choices made to hide true age may be a factor for women aged 45 to 65 years (Clarke, Griffin and Maliha 2009; Twigg 2007).

The findings show that 50% of women were unhappy with their age, and that 80% of women had noticed some significant change in their breasts with ageing. Previous research has cited changes to the breast as a contributing factor to unhappiness with general increasing age (McLaren and Kuh 2004; Risius et al. 2012), therefore, it may be inferred that a suitable choice of bra to reduce the signs of ageing may improve a woman's happiness (Clarke, Griffin and Maliha 2009). Bras may need to be designed to cope with the specific breast changes due to age, such as sagging (28%) and reduced firmness (10%). Addressing these bra requirements of the mature women's breast could improve breast shape, lift and torso silhouette, which are rated as key bra variables for women in this age range, and may potentially have health related implications. For example, without appropriate breast lift for the ptotic breast, the distribution of weight on the upper torso may cause postural adaptation or costoclavicular syndrome, which is prevalent in heavy breasted older women (De Silva 1986).

Important aspects of bra design are dually centred on internal and external factors. Specifically, the internal wearer's perception (e.g., support, comfort, fit, stays in place, shoulder straps, fabric, and discreetness) and external bra factors related to the perception of others (e.g., silhouette, appearance under clothes, shape, and lift) were important aspects. Although previous literature (Dewsnap and Hart 2004; Liang 2008; Liao and Lee 2010; Singer and Grismaijer 2006; Yip, Law and Wong 2007) indicates a separation between self-perception and societies perception, this study is the first to determine bra related performance variables of this nature based on survey results and statistical analysis. The external factors of importance identified here are those that may affect the youthful appearance of the breast, and therefore how others may perceive a woman. Although bra research has not previously grouped such variables through factor analysis, assumptions have been made in past research that reflect both internal and external factors. For example, the description of a perception driven scale of 'utilitarian' to 'glamorous' bras, the 'functional' and 'visual' properties of a bra, and 'intrinsic' and 'extrinsic' cues when purchasing bras (Dewsnap and Hart 2004; Liang 2008; Liao and Lee 2010; Singer and Grismaijer 2006; Yip, Law and Wong 2007).

It has been suggested that the weighting on internal and external bra related factors may be influenced by social occasion and intended use of the bra, for example, having different bras for day time and evening use, dependent on clothing and occasion (Dewsnap and Hart 2004). The current study supports this extant literature, as 49% of women aged 45 to 65 years reported owning different bras for daytime and evening usage. Bra manufacturers may therefore need to provide bras designed based on a combination of aesthetic (external factors) and functional (internal factors) concerns so they are appropriate for different social occasions for women aged 45 to 65 years. The priority of these combined factors should be investigated further, to determine the weighting of a

woman's discursive femininity expressed by her choice of bra during at each occasion (Clarke and Griffin 2008).

Previous research has shown a discrepancy in breast size changes around menopause. The majority of literature reports a reduction in size of the breasts after menopause (Rosen 2001); although some lingerie experts have reported an increase of approximately one to two cup sizes in population breast size after 40 years of age (Tonkelaar, Peeters and van Noord 2004). The results of the current study show that 51% of respondents had experienced an increase in breast size since the age of 45 years, a greater percentage than previous research, which found just 18% of women required a larger bra size after menopause (Tonkelaar, Peeters and van Noord 2004). The current study did not aim to explore the source of changes in breast size; however, previous literature has attributed the changes to a combination of menopause and general weight gain (Tonkelaar, Peeters and van Noord 2004). Discrepancy in the literature regarding the effect of ageing on breast size creates difficulty in understanding mature women's bra requirements (Rosen 2001; Katch et al. 2005; Tonkelaar, Peeters and van Noord 2004). The majority of current bras are manufactured based on sample sizes of a pert 34B prototype model, with some companies also fitting one larger size (Hardaker and Fozzard, 1997), sizes are then heuristically scaled up or down based on this prototype size. Literature would suggest that the youthful body is the 'norm' not only within the aesthetic and visual world (Clarke and Griffin 2008; Clarke, Griffin and Maliha 2009; Twigg 2007), but also within the manufacturing world. Just as the mature consumer is typically excluded from media advertisements and erotic roles, the consideration of breast ptosis or postural changes within older women is not mentioned in the literature regarding bra design (Hardaker and Fozzard 1997). As women's body shape alters with age (Ashdown and Na 2008), the potential for poor brassiere fit may increase. These age related changes may not be catered for by the apparel industry and the availability of well-fitting brassieres for older women warrants investigation.

Irrespective of age, a significant correlation was found between cup size and internal bra factors ($r_s = .169$, $p = .016$), indicating that women aged 45 to 65 years with larger cup sizes, rated bra support, comfort, fit, bra's ability to stay in place, shoulder straps, fabric, discreetness and brand, as more important than women of smaller cup sizes. This is in concordance with previous research that shows larger breasts require greater support (Gehlsen and Albohm 1980; Lorentzen and Lawson 1987) and that bra fitting with larger cup sizes can be more troublesome than smaller cup sizes (Greenbaum et al. 2003). From a fundamental perspective, inter-cup size differences indicate that breast support research should assess women of different cup sizes separately, as recent research has adopted (Scurr, White and Hedger 2011), due to the different support requirements and perceived importance of breast support.

The present results show that 62% of women would not now wear the bras they had worn in their twenties, and 43% stated they would not have worn their current bra when they were in their twenties. The explanation for this was beyond the scope of the present study, however, future research might consider either a change in preferences or a change in physical bra needs with increasing age, as proposed by Twigg (2007), who discussed an interplay between cultural factors and biological factors influencing clothing choice. Future research may

wish to investigate this further, particularly so from a marketing and psychological health perspective. With regard to bra aesthetics and clothing choice, the most common bra colours among the population were white, nude and black. Previous research has suggested that the colour of a bra can carry a social message, colours described as 'young' include purple, yellow and pink, 'older' colours include black, white and off-white (Sukumar 2007). Sukumar's (2007) theorised 'age of colour' phenomenon was explained by the mature woman's aversion to bright colours; it was claimed that bright colours make these women feel uneasy and they find comfort in duller colours (Sukumar 2007). Although colour was not listed as a key bra variable, this finding indicates that bras for women aged 45 to 65 years typically maintain neutral tones, rather than brighter colours. The style of bra most commonly worn by this population was a non-padded, underwire bra. Liang (2008) also indicated that mature women prefer non-padded underwire bras, whereas younger women more commonly wear padded, underwire bra. These findings indicate a need for longitudinal research to track the changes in bra preferences over time, rather than independent cross-sectional designs being implemented.

The findings presented here indicate that women aged 45 to 65 years acknowledge a change in their breasts and subsequently their bra requirements. Self perception may be negatively influenced by the age related changes in the breast, as only 7% of the women surveyed were proud of their breasts, with the majority viewing them as part of their personal femininity. The key bra variables for women of this age range were identified as: comfort, bra's ability to stay in place, fit, appearance under clothes, support, discreetness, shoulder straps, torso silhouette, breast shape, bra fabric and breast lift. It is therefore advised that everyday bras may be required to encompass the bra requirements of different age ranges. It is also advised that these 11 bra variables be the focus of subsequent studies regarding breast health and bra optimisation for women aged 45 to 65 years, as these are the most important considerations for bra satisfaction. By investigating these 11 bra variables for women aged 45 to 65 years, bra designs may be made more appropriate for women of this age (Risius et al. 2012).

Acknowledgments

The research team would like to acknowledge Playtex® for sponsoring this research. The financial sponsors were partly involved in the survey design, all execution, analysis and interpretation of data was solely conducted by the researchers.

References

- Ashtown S, Na H (2008) Comparison of 3-D body scan data to quantify upper-body postural variation in older and younger women. *Clothing & Textiles Research Journal*, 26:292-307. doi:10.1177/0887302X07309131
- Baltes MM, Carstensen LL (1996) The process of successful ageing. *Ageing and Society*, 16:397-422. doi:10.1017/S0144686X00003603
- Birtwistle G, Tsim C (2005) Consumer purchasing behaviour: an investigation of the UK mature women's clothing market. *Journal of Consumer Behaviour*, 4:453-64. doi:10.1002/cb.31
- Blaikie N (2003) *Analyzing quantitative data*. Sage Publications Limited, London
- Bowles KA, Steele JR, Munro B (2008) What are the breast support choices of Australian women during physical activity? *British Journal of Sports Medicine*, 42:670-4. doi:10.1136/bjsm.2008.046219

Brown TP, Ringrose C, Hyland RE, Cole AA, Brotherston TM (1999) A method of assessing female breast morphometry and its clinical application. *British Journal of Plastic Surgery*, 52:355-9. doi:10.1054/bjps.1999.3110

Caldwell D (1981) *And all was revealed: ladies' underwear, 1907-1980*. St Martin's, New York

Clarke LH, Griffin M (2008) Visible and invisible ageing: beauty work as a response to ageism. *Ageing & Society*, 28:653-74. doi: 10.1017/S0144686X07007003

Clarke LH, Griffin M, Maliha K (2009) Bat wings, bunions, and turkey wattles: body transgressions and older women's strategic clothing choices. *Ageing & Society*, 29:709-26. doi:10.1017/S0144686X08008283

Clegg F (1998) *Simple statistics*. Cambridge University Press, Cambridge

Davies E L, Gateley CA, Miers M, Mansel RE (1998) The long-term course of mastalgia. *Journal of the Royal Society of Medicine*, 91:462-4. doi: 10.1177/014107689809100903

Deeks AA, McCabe MP (2001) Menopausal stage and age and perceptions of body image. *Psychology & Health*, 16:367-79. doi:10.1080/08870440108405513

Dewsnap B, Hart C (2004) Category management: a new approach for fashion marketing. *European Journal of Marketing*, 38:809-34. doi:10.1108/03090560410539267

De Silva M (1986) The costoclavicular syndrome: a new cause. *Annals of the Rheumatic Diseases*, 45:916-20. doi: 10.1136/ard.45.11.916

Dillman D, Sinclair M, Clarke J (1993) Effects of questionnaire length, respondent-friendly design, and a difficult question on response rates for occupant-addressed census mail surveys. *Oxford Journals*, 57: 289-304. doi: 10.1086/269376

Field AP (2009) *Discovering statistics using SPSS*. SAGE Publications Incorporated, London.

Frazer L, Lawley M (2000) *Questionnaire Design & Administration*. John Wiley & Sons Australia Ltd, Queensland

Garland R (1991) The mid-point on a rating scale: is it desirable? *Marketing Bulletin*, 2:66-70

Gehlsen G, Albohm M (1980) Evaluation of sports bras. *The Physician and Sports Medicine*, 8:85-96.

Gillham B (2007) *Developing a questionnaire*, 2nd Edition. Continuum International Publishing Group, London

Godwin Y, Wood SH, O'Neill TJ (1998) A comparison of the patient and surgeon opinion on the long-term aesthetic outcome of reduction mammoplasty. *British Journal of Plastic Surgery*, 51:444-9. doi:10.1054/bjps.1997.0081

Greenbaum AR, Heslop T, Morris J, Dunn KW (2003) An investigation of the suitability of bra fit in women referred for reduction mammoplasty. *British Journal of Plastic Surgery*, 56:230-6. doi:10.1016/S0007-1226(03)00122-X

Hardaker C, Fozzard G (1997) Communications: the bra design process - a study of professional practice. *International Journal of Clothing Science and Technology*, 9:311-25. doi:10.1108/09556229710175795

Hasson D, Arnetz BB (2005) Validation and findings comparing VAS vs. likert scales for psychosocial measurements. *International Electronic Journal of Health Education*, 8:178-92

Hinkin TR (1995) A review of scale development practices in the study of organizations. *Journal of Management*, 21:967-88. doi:10.1177/014920639502100509

Hsieh C (2011) Money and happiness: does age make a difference? *Ageing and Society*, 31:1289-1306. doi:10.1017/S0144686X10001431

Jamieson S (2004) Likert scales: how to (ab)use them. *Medical Education*, 38:1212-8. doi:10.1111/j.1365-2929.2004.02012.x

Katch L, Campaigne B, Freedson P, Sady S, Katch F, Behnke A (2005) Contribution of breast volume and weight to body fat distribution in females. *American Journal of Physical Anthropology*, 53:93-100. doi:10.1002/ajpa.1330530113

Kim J, Hong K, Scheurell DM (2004) Applying QFD in the development of sensible brassiere for middle aged women. *Journal of the Korean Society of Clothing and Textiles*, 28:1596-604.

Krenzer G, Starr C, Branson D (2005) Development of a sports bra prototype: patternworks international best solution to a patternmaking problem 2000. *Clothing and Textile Research Journal*, 23:131-4. doi:10.1177/0887302X0502300206

Liang X (2008) An investigation into the pressures and sensations caused by wearing a bra and the influence of these on bra fitting. Doctoral Dissertation, De Montfort University

Liao C, Lee C (2010) The application of codesign in new bra product innovations. *International Journal of Clothing Science and Technology*, 22:211-27. doi:10.1108/09556221011018676

Litwin M (1995) *How to Measure Survey Reliability & Validity*. Sage Publications Ltd, London

Liu C, Arnett K (2000) Exploring the factors associated with web site success in the context of electronic commerce. *Information & Management*, 38:23-33. Doi:10.1016/S0378-7206(00)00049-5

Lorentzen D, Lawson L (1987) Selected sports bras: a biomechanical analysis of breast motion while jogging. *The Physician and Sports Medicine*, 15:128-39.

McGhee DE, Steele JR (2006) How do respiratory state and measurement method affect bra size calculations? *British Journal of Sports Med*, 40:970-4. doi:10.1136/bjsm.2005.025171

McLaren L, Kuh D (2004) Body dissatisfaction in midlife women. *Journal of Women & Aging*, 16: 35-54. doi:10.1300/J074v16n01_04

Oberg P, Tornstam L (1999) Body images among men and women of different ages. *Ageing & Society*, 19:629-44.

Paulson S, Willig C (2008) Older women and everyday talk about the aging body. *Journal of Health Psychology*, 13:106-20. doi:10.1177/1359105307084316

Risius D, Thelwell R, Wagstaff C, Scurr J (2012) Influential factors of bra purchasing in older women. *Journal of Fashion Marketing and Management*, 16:366-80. doi:10.1108/13612021211246099

Rosen PP (2001) *Rosen's breast pathology* (2 ed.). Lippincott Williams & Wilkins, Philadelphia

Sousa V, Zauszniewski J, Musil C (2004) How to determine whether a convenience sample represents the population. *Applied Nursing Research*, 17:130-133. doi:10.1016/j.apnr.2004.03.003

Scurr JC, White JL, Hedger W (2011) Supported and unsupported breast displacement in three dimensions across treadmill activity levels. *Journal of Sports Sciences*, 29:55-61. doi:10.1080/02640414.2010.521944

Singer SR, Grisamaijer S (2006) *Dressed to Kill the Link Between Breast Cancer and Bras*. Avery Publishing Group, New York

- Sukumar S (2007) The bra and the Indian woman's notion of sexuality. *Journal of Creative Communications*, 2:267-78. doi:10.1177/097325860700200301
- Tonkelaar I, Peeters P, van Noord P (2004) Increase in breast size after menopause: prevalence and determinants. *Maturitas*, 48:51-7. doi:10.1016/j.maturitas.2003.10.002
- Tsaousi C, Brewis J (2013) Are you feeling special today? Underwear and the 'fashioning' of female identity. *Culture and Organization*, 19:1-21. doi:10.1080/14759551.2011.634196
- Twigg J (2007) Clothing, age and the body: a critical review. *Ageing & Society*, 27:285-305. doi:10.1017/S0144686X06005794
- Twigg J (2012) Adjusting the cut: fashion, the body and age on the UK high street. *Ageing and Society*, 32:1008-29. doi:10.1017/S0144686X11000754
- Yip J, Law D, Wong Z (2007) An investigation of intimate apparel buying behaviour among fashion conscious and non-fashion conscious Chinese Hong Kong female consumers. Paper presented at the 2007 Annual Institutional Research Meeting, Feng Chia University.

Table one. Participant ratings of the bra variables, presented from the largest to the smallest percentage of participants rating the criterion as important. Those deemed key variables, based on a mode value of four or five, are presented in *italic*.

Performance Variable	Mode	Per cent rating as important	Per cent rating as neutral	Per cent rating as unimportant
<i>Comfort</i>	5	99	1	1
<i>Bra stays in place</i>	5	97	3	0
<i>Fit</i>	5	93	5	1
<i>Appearance under clothes</i>	5	86	9	5
<i>Support</i>	5	84	10	6
<i>Discreetness</i>	4	80	16	4
<i>Shoulder straps</i>	4	73	21	6
<i>Torso silhouette</i>	4	77	17	7
<i>Breast shape</i>	4	76	19	4
<i>Fabric</i>	4	66	19	14
<i>Breast lift</i>	4	62	29	9
Colour	3	43	36	21
Price	3	41	42	17
Matching underwear	1	24	26	51
Brand	1	12	24	64

Table two. Factor loading in principal component analysis. Bold text indicates the highest loading factor for each bra performance variable.

Item	Component	
	1	2
Silhouette	.799	.202
Appearance under clothes	.737	.151
Shape	.721	.229
Lift	.504	.152
Support	-.003	.733
Comfort	-.173	.727
Fit	.185	.784
Stays in Place	.084	.597
Straps	-.085	.530
Fabric	.213	.456
Discreetness	.253	.353
Total variance explained		
	24.1%	15.1%

Table three. Correlation coefficients of factors one and two (external and internal) with participant characteristics: age, cup size, band size, HRT use and parity.

	External factors (r_s value)	Internal factors (r_s value)
Age	.052	.065
Cup Size	-.045	.169*
Band Size	-.034	.093
HRT use	-.080	-.012
Parity	.040	-.003

Note: * = $p < 0.05$